

REMARKS

Claims 19-34 are pending in the above-identified application.

Issues under 35 USC 103(a)

Claims 19-21, 23-26 and 28-30 have been rejected under 35 USC 103(a) as being unpatentable over Hämäläinen '243 (US 5,627,243) in view of Rhee '149 (US 4,933,149).

Claims 22 and 27 have been rejected under 35 USC 103(a) as being unpatentable over Hämäläinen '243 and Rhee '149, in view of Yamamoto '798 (EP 0 721 798) and Grott '208 (US 5,837,208).

Claims 31-34 have been rejected under 35 USC 103(a) as being unpatentable over Hämäläinen '243 in view of Veariel '532 (US 6,838,532), Yamamoto '798 and Grott '208.

It is submitted that the present claims patentably define over these references based on the following reasons.

Present Invention and Submission of Declaration under 37 CFR 1.132

Submitted with this Response is a Declaration under 37 CFR 1.132 by one of the inventors (hereinafter the "Heino Declaration"). As explained in the Heino Declaration, before the present invention was devised, the general problem in the fluidized bed gas phase reactor used by the inventors was the fouling of the gas distributor plate. After some time of operation, when a sufficient amount of polymer had accumulated there, the polymer formed nearly a solid cake which caused problems with respect to the operation of the process. The inventors took some time in studying this problem and they found that the problem was the accumulation of polymer on the edge of gas distributor plate (the area touching the wall). Accumulation started from there and finally the agglomerates grew so that they covered substantial fractions of the distributor plate. The inventors then decided to replace the gas distributor plate with the presently claimed one. They found that the problems of fouling the gas distributor plate reduced substantially and now the reactor has been operated for longer periods (of more than one year) without fouling on the gas distributor plate.

The present inventors have found that by producing a gas stream sweeping along the periphery of the reactor walls and having a sufficient velocity it was possible to prevent these particles from adhering to the reactor walls. This is achieved by employing a distribution plate with an annular opening which allows for at least 30% of the total gas flow to be conducted along the periphery of the reactor walls. By employing the above-described features, the method and device of the present invention advantageously suppress the formation of the agglomerates at the wall or near the distributor plate so as to provide for stable operation. This is evidenced by the description of the Example at pages 10-11 of the present specification. It was only after an intensive study by the inventors, including calculations of flow patterns in the gas phase reactor, that they were able to discover stagnant zones formed at the level of the fluidization grid at the wall of the reactor. They also found that the known designs of fluidization grid could not overcome the problem. In the end, the inventors came to the present invention where a gas flow is directed to pass the fluidization grid along the wall. After installing the present invention in the pilot plant reactor they found that fouling reduced substantially and they could run long campaigns with many grade changes without problems.

The inventors agree that a significant reason for fouling was the stagnant zone formed at the edge limited by the reactor wall and the distribution grid. However, nothing in the prior art suggested that this would have been the case. Therefore, the prior art failed to provide a person skilled in the art with any reasonable basis for a motivation to arrive at the present invention. This is evident from the discussion in the Heino Declaration, as well as the discussion regarding the distinctions over the cited references below.

Distinctions over Hämäläinen '243

Several significant distinctions exist between the method and device of the presently claimed invention and Hämäläinen '243. First, note that present claim 19 defines a polymerization reactor as "having an upper part in which a reactor bed of fluidized catalyst particles can be formed, and a lower part, in which monomer gas can be introduced, said upper and said lower parts being separated by a distribution plate..." Claim 19 goes on to recite that,

“at least 30% of the total flow of gas through the distribution plate is conducted along the periphery of the inside of the reactor walls. “

Hämäläinen ‘243 discloses a fluidized bed reactor which includes “flow control elements formed by plate-like surfaces perforated with a number of holes and located so that a major part of the gas flow is directed sideways below the means and a minor part of the gas flow is directed upwards to pass through the holes in the flow means” (from col. 2, line 65 to col. 3, line 3). However, the “flow control element” of Hämäläinen ‘243 fails to correspond to the “distribution plate” of the presently claimed invention for the following reasons.

First, Hämäläinen ‘243 is directed towards solving the problem of the adherence of polymer particles to the wall surfaces of the reactor bottom section (col. 1, lines 64 to 65), not adherence to any corresponding distribution plate. The polymer particles are those that were carried away from the reactor by the circulation gas (col. 1, line 65 to col. 2, line 2).

Second, the “flow control elements” of Hämäläinen ‘243 are located in the bottom section of the fluidized bed reactor (col. 2, lines 60 to 62; col. 3, lines 4 to 6; Figure 1, reference number 30; col. 6, lines 1 to 3). This contrasts with the present invention, wherein the distribution plate is located in the reactor so as to separate an upper part, in which a reactor bed of fluidized catalyst particles are formed, and a lower part, in which monomer gas is introduced. The distribution plate of Hämäläinen ‘243 is shown in Figure 1 as element 15 (col. 5, lines 57 to 62). The text in col. 5, line 57 onwards states that, “The polymerization space 12 and the mixing space 13 are separated from each other by a gas distribution plate 15...”

Third, Hämäläinen ‘243 describes directing a part of the flow sideways and a part of the flow upwards; but it is clear that this is done by the “flow control element” 30 (see, for instance, col. 2, line 65 to col. 3, line 3; col.3, lines 4 to 12; col. 4, lines 17 to 29). The flow control element divides the flow within the mixing space 13 (or, the bottom section) of the reactor and directs the flow into the walls of the reactor therein. However, because of the presence of the gas distribution plate 15 there is no or little influence on the flow pattern within the polymerization space 12.

In contrast, the present invention employs a new gas distribution plate design distinct from that of the distribution plate 15 of Hämäläinen ‘243. According to the present invention this

gas distribution plate is designed so that there is an annular opening between the reactor wall and the outer edge of the gas distribution plate. This new design would allow the gas flow to sweep the reactor walls within the polymerization space 12 of Figure 1 of Hämäläinen '243.

Thus, several significant patentable distinctions exist over Hämäläinen '243 as described above. Also, the objective of Hämäläinen '243 was to improve the flow profile in the mixing space 13 by using special elements directing a part of the gas flow sideways and a minor part of the flow upwards. This was intended to prevent polymer agglomeration in the mixing space. However, in this "mixing space" there is no fluidized bed present. The amount of polymer in the mixing space is small. The only polymer present there are the particles that have been entrained by the fluidization gas from the bed. In contrast, the present invention is directed towards improving the operation of the polymerization space 12 of Hämäläinen '243 where the fluidized bed is present. Thus, Hämäläinen '243 fails to provide any reasonable basis to one skilled in the art to modify the described distribution plate in an attempt to obtain the present invention.

It is also clear that the "flow control elements" 30 of Hämäläinen '243 cannot be alleged to correspond to the "gas distribution plate" of the present claims. The wording of claim 19 makes clear that the gas distribution plate separates the upper part, in which a reactor bed of fluidized catalyst particles can be formed, and a lower part, in which monomer gas can be introduced. In Hämäläinen '243 the "flow control element" does not separate the polymerization space (where the fluidized bed is present) from the mixing space (where the gas is introduced). It is clear from Hämäläinen '243 that it is the gas distribution plate 15 which separates the polymerization space from the mixing space. Especially, there can be no fluidized bed immediately above the "flow control element" 30 because the gas distribution plate 15 blocks the passage of polymer (col. 5, lines 60 to 62). Please additionally note that the present specification addresses Hämäläinen '243 in paragraph [0043].

Finally, it is submitted that even though the "flow control element" of Hämäläinen '243 directs the gas to the reactor wall in the mixing space 13, the gas flow at the wall moving upwards then hits the distribution plate 15. A gas distribution plate of such a prior art design would then prevent the gas from sweeping along the wall of the polymerization space 12 because it would have been solid at the wall and thus no gas flow could pass through. Depending on the

design there could have been a gas flow near the wall but it would not have swept the wall and especially it could not have kept clean the edge where the gas distribution plate was connected to the wall.

In view of the above, as well as in view of the discussion in the Heino Declaration confirming these points, numerous patentable distinctions exist over Hämäläinen '243 such that the rejections based on the primary reference must all be withdrawn.

Distinctions over Other Cited References

Rhee '149 discloses a fluidized bed reactor which includes a periphery flow **33a** as shown in Figures 2-3 and discussed at columns 9-10. The reactor includes a distributor plate **28** as shown in Figure 4.

Rhee '149 fails to disclose or suggest a method or reactor structure which would allow for feeding at least 30% of a gas stream along the periphery of the inside reactor walls, as in the present invention. Note that the distributor plate of the reactor of Rhee '149 does not have sufficient opening to allow for this to occur. Consequently, significant patentable distinctions exist between the present invention and Rhee '149.

Similar to the above-noted distinctions, it is also apparent from the distributor plate **2** in Figure 2 of Yamamoto '798, the distribution tray **22** with its periphery joined to the wall **15** of Grott '208, and the distributor plate **185** in Figure 1 of Veariel '532, that these distributor plate designs can not allow for 30% of the gas stream to be fed along periphery of the inside of the reactor walls past the distributor plate as in the present invention. Thus, significant patentable distinctions exist between the present invention and each of these references as well.

It is submitted for the reasons above that the present claims define patentable subject matter such that this application should now be placed in condition for allowance.

If any questions arise in the above matters, please contact Applicant's representative, Andrew D. Meikle (Reg. No. 32,868), in the Washington Metropolitan Area at the phone number listed below.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37.C.F.R. §§1.16 or 1.17; particularly, extension of time fees.

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Respectfully submitted,

By 

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Enclosure: Heino Declaration under 37 CFR 1.132